DOINGWHATWORKS

Slideshow

FULL DETAILS AND TRANSCRIPT

Teaching Word Problem Structures

John Wash Elementary School, California • March 2010

Topic: Response to Intervention in Elementary-Middle Math
Practice: Foundations of Arithmetic

Highlights

- Explicit teaching about word problems, including identification of features of word problems and word problem types as well as how to distinguish irrelevant information
- Examples of common problem schema in elementary school mathematics and variations of terminology
- Use of informal sketches in problem representation
- Practice with unfamiliar problems to identify known structures
- Multistep, more complex problems
- Importance of professional development for interventionists

About the Site

John Wash Elementary School

Fresno, CA

Demographics

41% Hispanic

37% Asian

18% White
2% Black
1% Other
53% Free or Reduced-Price Lunch
22% English Language Learners
4% Special Education

John Wash Elementary School staff work collaboratively to improve teaching and learning. Through principal leadership, district support, and professional development, John Wash established:

- A three-tiered pyramid of instruction and intervention;
- Systematic and explicit instructional practices that support and engage all students, including English language learners;
- Professional learning communities for using data and planning evidence-based instruction;
- Systems of mutual accountability for student learning.

Full Transcript

Presentation title: Teaching Word Problem Structures

Title screen: Students in Tiers 2 and 3 mathematics interventions benefit from systematic instruction on solving word problems. The ability to solve word problems is important to success in mathematics because it helps students gain insight into mathematics and how it applies to their lives.

Slide 1: Research findings

Interventionists can help struggling students learn strategies for solving word problems. Students can be taught how to identify the key features of problems. They can learn about different problem types and how to determine which operation—addition, subtraction, multiplication, division—is used to solve each type of problem.

Slide 2: Irrelevant information

Students also benefit from being taught to identify information in word problems that is irrelevant to the solution. Students learn that superficial information may change a problem but not its underlying structure or the operation used for deriving its solution.

Slide 3: Explanations

Interventionists demonstrate step-by-step problem solving with explanations and practice at each step. Struggling students receive direct explanations from the teacher to help them make sense of a problem by figuring out which schema or common pattern the problem matches.

Slide 4: Schemas

Examples of types of schemas for simple elementary problems include combining problems, comparison problems, and partition problems. An interventionist helps a student locate the parts of the problem statement that describe the units or sets involved and the relationship between them.

Slide 5: Comparison example

In a comparison problem, the student would note which two groups are being compared. Does the problem ask how many more are in one set than another?

Slide 6: Variations on schemas

Math educators vary the labels they use to describe categories of problems: change, grouping, repeated multiplication, vary, part-whole, restate, and so forth.

Terminology varies, but the instructional concept is the same: teach students to recognize the underlying structure of a problem type and which operation solves problems of that type.

Slide 7: Problem representation

One way to help students figure out the features of a problem statement is to use simple and informal sketches, such as strip diagrams, to represent what is known. In a comparison problem, a sketch of each group being compared would show the relationship of the two sets.

Slide 8: Solution rules

Once a student can analyze the problem type, the interventionist offers solution rules or models guiding questions that lead to a solution. Students need lots of practice with this step, including guided practice and practice in pairs articulating explanations to their partners. Examples of both fully worked and partially worked problems are helpful.

Slide 9: Unfamiliar problems

Students need practice in recognizing familiar problem types "in disguise," when format of the problem changes, the situation is different, vocabulary changes (one-half is written as 1/2), irrelevant information is introduced, or information is missing. Struggling students benefit from lots of practice with variations in cover stories and features, including irrelevant features.

Slide 10: More complex problems

As students progress to upper elementary grades, they will encounter more complex problems that involve multiple steps. A two-step problem may involve both change and comparison schemas, for example.

Slide 11: Structure

To solve two-step word problems, interventionists provide explicit instruction in identifying the primary question and the secondary question, and the relationship between the solutions to the two problem types.

Slide 12: Professional development

Interventionists will likely need support from a mathematics specialist to determine problem types and develop instructional sequences as well as ongoing guided practice in planning and modeling problem types. Coaching helps to ensure that interventionists are conveying information clearly and accurately to students.